

## MO 9: Poster: Collisions, Energy Transfer

Time: Tuesday 16:00–18:30

Location: Lichthof

MO 9.1 Tu 16:00 Lichthof

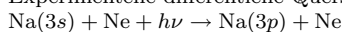
**Electron impact ionisation of aligned hydrogen molecules** — ●ARNE SENFTLEBEN, XUEGUANG REN, THOMAS PFLÜGER, ALEXANDER DORN, and JOACHIM ULLRICH — Max-Planck-Institut für Kernphysik

Fully differential cross-sections (FDCS) for electron impact ionization of simple molecules have found increased interest over the last years. However, up to now no experimental data has been available for aligned molecules. Using an advanced reaction microscope we performed a kinematically complete experiment where the momentum vectors of all final state particles were determined. The alignment of the molecular axis was derived from post-collision dissociation of the residual ion. Results will be presented for two distinct reaction channels: Ground-state ionisation and autoionisation.

MO 9.2 Tu 16:00 Lichthof

**Potentiale von Alkali-Edelgas-Systemen aus spektroskopischen und Streudaten** — ●OLAF HOFFMANN<sup>1</sup>, JOACHIM GROSSER<sup>1</sup>, FRANK REBENTROST<sup>2</sup> und EBERHARD TIEMANN<sup>3</sup> — <sup>1</sup>Institut für Gravitationsphysik, Hannover — <sup>2</sup>Max-Planck-Institut für Quantenoptik, Garching — <sup>3</sup>Institut für Quantenoptik, Hannover

Experimentelle differentielle Querschnitte optischer Stöße



werden gemeinsam mit experimentellen Linienpositionen dazu verwendet, die Potentiale für den Grundzustand  $X^2\Sigma$  und den ersten angeregten Zustand  $A^2\Pi$  des NaNe-Systems mit großer Genauigkeit zu bestimmen. Für das NaXe-System verwenden wir ausschließlich Streudaten, aus denen wir die Potentiale der Zustände  $X^2\Sigma$  und  $B^2\Sigma$  gewinnen.

MO 9.3 Tu 16:00 Lichthof

**Gleichzeitige optische Anregung beider Stoßpartner während des Stoßprozesses Na+CF<sub>4</sub>** — ●OLAF HOFFMANN<sup>1</sup>, VADIM A. ALEKSEEV<sup>2</sup>, JOACHIM GROSSER<sup>1</sup> und FRANK REBENTROST<sup>3</sup> — <sup>1</sup>Institut für Gravitationsphysik, Hannover — <sup>2</sup>Department of Physics, St. Petersburg State University, Russland — <sup>3</sup>Max-Planck-Institut für Quantenoptik, Garching

Bei der optischen Anregung des Stoßpaares Na+CF<sub>4</sub> beobachten wir die gleichzeitige optische Anregung beider Partner während des Stoßes:  $\text{Na}(3s) + \text{CF}_4(\nu_3 = 0) + h\nu \rightarrow \text{Na}(3d) + \text{CF}_4(\nu_3 = 1)$

Die spektrale Intensitätsverteilung und die enge Winkelverteilung der Stoßprodukte legen einen Prozess bei großen Abständen der Stoßpartner nahe. Geschwindigkeitsaufgelöste Messungen werden mit den Ergebnissen numerischer Modellrechnungen verglichen. Polarisationsmessungen erlauben die Analyse geometrischer Eigenschaften des Stoßpaares.

MO 9.4 Tu 16:00 Lichthof

**Differential cross section of the reactive collision O(<sup>1</sup>D)+D<sub>2</sub>: A 3D Velocity Mapping study** — ●S. KAUCZOK, C. MAUL,

and K.-H. GERICKE — Institut für Physikalische und Theoretische Chemie, TU Braunschweig

For measuring the full double differential cross section of a reactive collision, reactant preparation with defined initial velocities and quantum states in number densities high enough to achieve acceptable count rates, but low enough to prevent secondary collisions, is - alongside the technique for final product velocity measurement - most important.[1]

We present a method for measuring the differential cross section of photo-initiated reactions employing only one molecular beam. Both, one reactant and the precursor of the other reactant are present in the same molecular beam and the center of mass velocity is selected by shifting the dissociation and the detection laser in time and space. Like in analogous measurements with crossed molecular beams using REMPI spectroscopy for product detection, this produces a bias in the measured velocity distribution due to the fact that the reaction takes place in the whole volume surrounding the laser beams. This fact is taken into account by a forward convolution analysis and backward code based on probabilistic considerations designed by us.

In order to demonstrate the applicability of this technique, we have re-investigated the well-studied reaction of O(<sup>1</sup>D) with D<sub>2</sub>.

[1] S. Kauczok, N. Gödecke, A. Chichinin, M. Veckenstedt, C. Maul, K.-H. Gericke, *Rev. Sci. Instr.* **80**, 083301 (2009); A. Chichinin, S. Kauczok, K.-H. Gericke, C. Maul, *Int. Rev. Phys. Chem.* **28**, 607 (2009)

MO 9.5 Tu 16:00 Lichthof

**Three-dimensional velocity map imaging: Setup and resolution improvement compared to three-dimensional ion imaging** — S. KAUCZOK<sup>1</sup>, N. GÖDECKE<sup>1</sup>, A. CHICHININ<sup>1,2</sup>, ●M. VECKENSTEDT<sup>1</sup>, C. MAUL<sup>1</sup>, and K.-H. GERICKE<sup>1</sup> — <sup>1</sup>Institut für Physikalische und Theoretische Chemie, TU Braunschweig — <sup>2</sup>Institute of Chemical Kinetics and Combustion, Novosibirsk, Russia

For many years 3D ion imaging has not benefitted from the introduction of ion optics into chemical imaging. Thus, a lower resolution of kinetic energy as in comparable techniques making use of inhomogeneous electric fields was inevitable. This was basically due to the fact that a homogeneous electric field was needed in order to obtain the velocity component in the direction of the time of flight spectrometer axis. In our approach we superimpose an Einzel lens field with the homogeneous field. We use a simulation based technique to account for the distortion of the ion cloud caused by the inhomogeneous field.

In order to demonstrate the gain in kinetic energy resolution compared to conventional 3D Ion Imaging, we use the spatial distribution of H<sup>+</sup> ions emerging from the photodissociation of HCl following the two photon excitation to the V<sup>1</sup>Σ<sup>+</sup> state. So far a figure of merit of approximately four has been achieved, which means in absolute numbers  $\Delta v/v=0.022$  compared to 0.086 at  $v=17000$  m/s.

HBr photodissociation at 243 nm was used to recognize and eliminate systematic deviations between simulation and experimentally observed distribution. The technique has also proven to be essential for the precise measurement of translationally cold distributions.